DEVELOPING TALENT • GROWING VENTURES • OPENING MARKETS

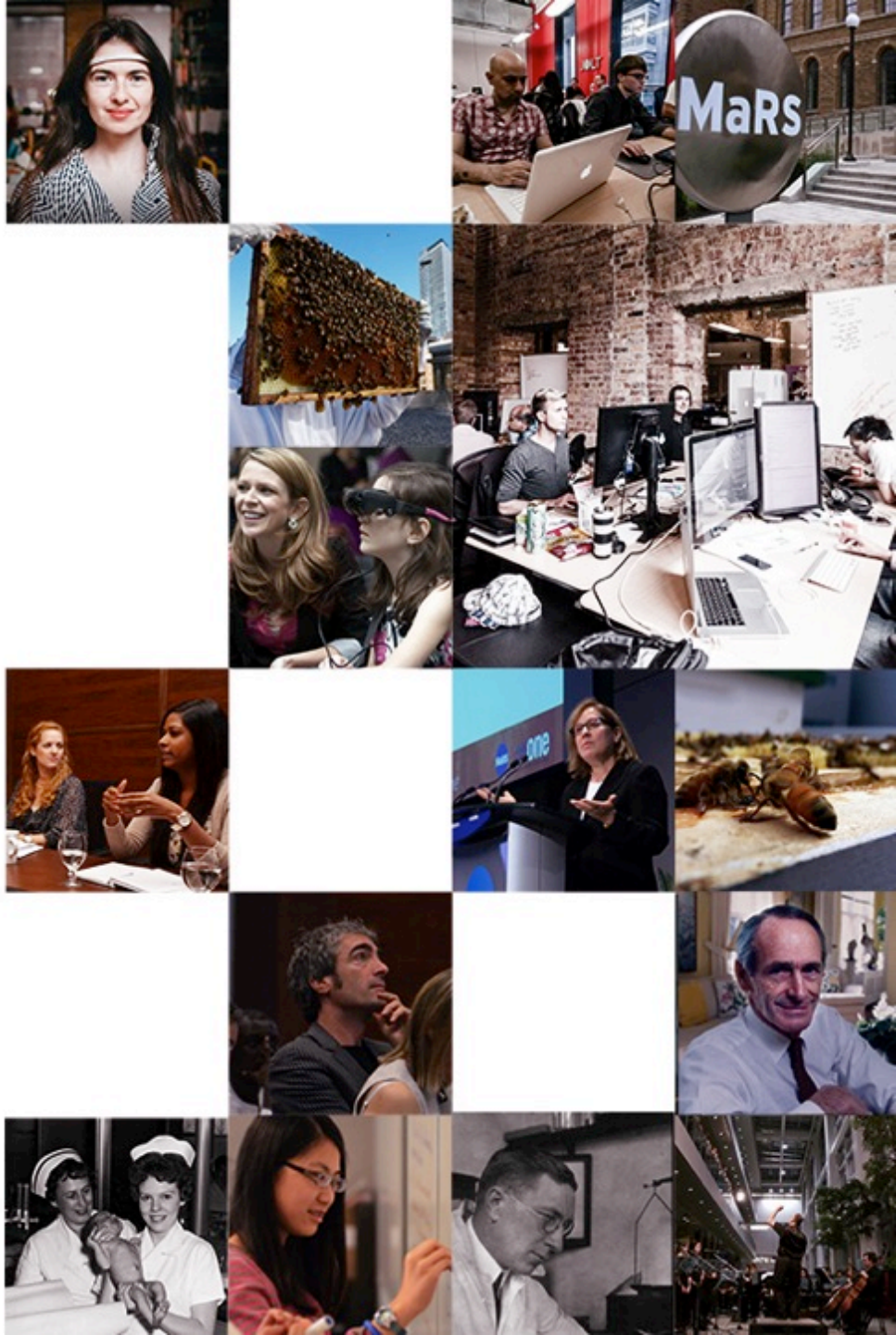
Symposium on Open Energy Systems

Infrastructure Disruption

BECAUSE THE FUTURE MATTERS

FEBRUARY 2015

Visit us at **marsdd.com**



Our Future Matters.

Build the new economy. Improve society.

MaRS works with partners to catalyze, accelerate, scale and diffuse innovation.

We help entrepreneurs start and grow successful global companies.

Together, we help Canada prosper.

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MaRS: Urban Innovation Hub

Linking creative & business assets of Toronto

Discovery District Financial District Creative & Arts District

Royal Conservatory of Music

University of Toronto

UHN Princess Margaret

Mount Sinai

Toronto Rehab

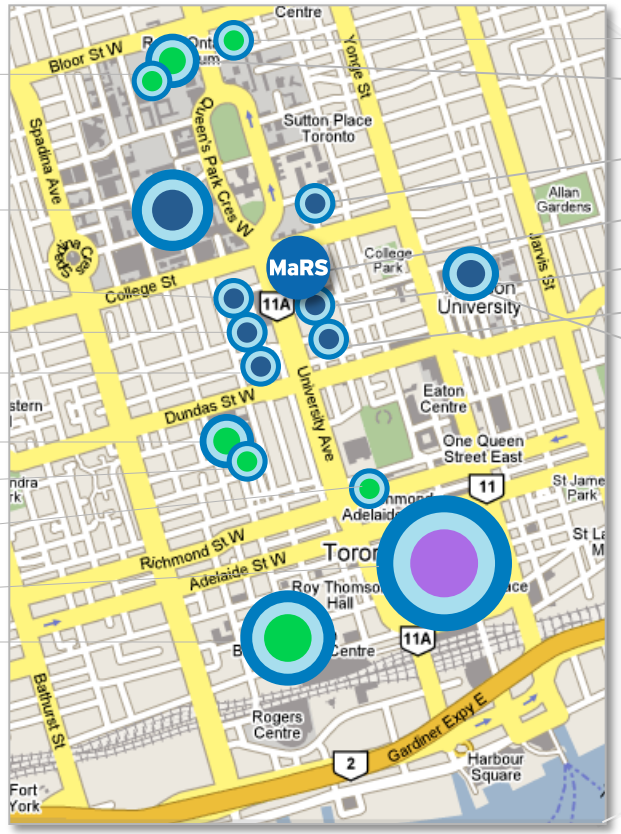
Art Gallery of Ontario

TIFF & OCADU

Four Seasons Centre

Financial District

Entertainment District



Gardiner Museum of Ceramic Art

Royal Ontario Museum

Women's College

The MaRS Centre

UHN Toronto General Hospital for Sick children

Ryerson University

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DISCOVERY OF INSULIN

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DISCOVERY OF STEM CELLS

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PHASE 1
• 700,000 sq ft
• 100 Tenants – 50 startups
• 4:1 Private/Public
• 2,500+ People work at MaRS today
PHASE 2
• 780,000 sq ft
• Opened Jan 2014

Supporting Innovation

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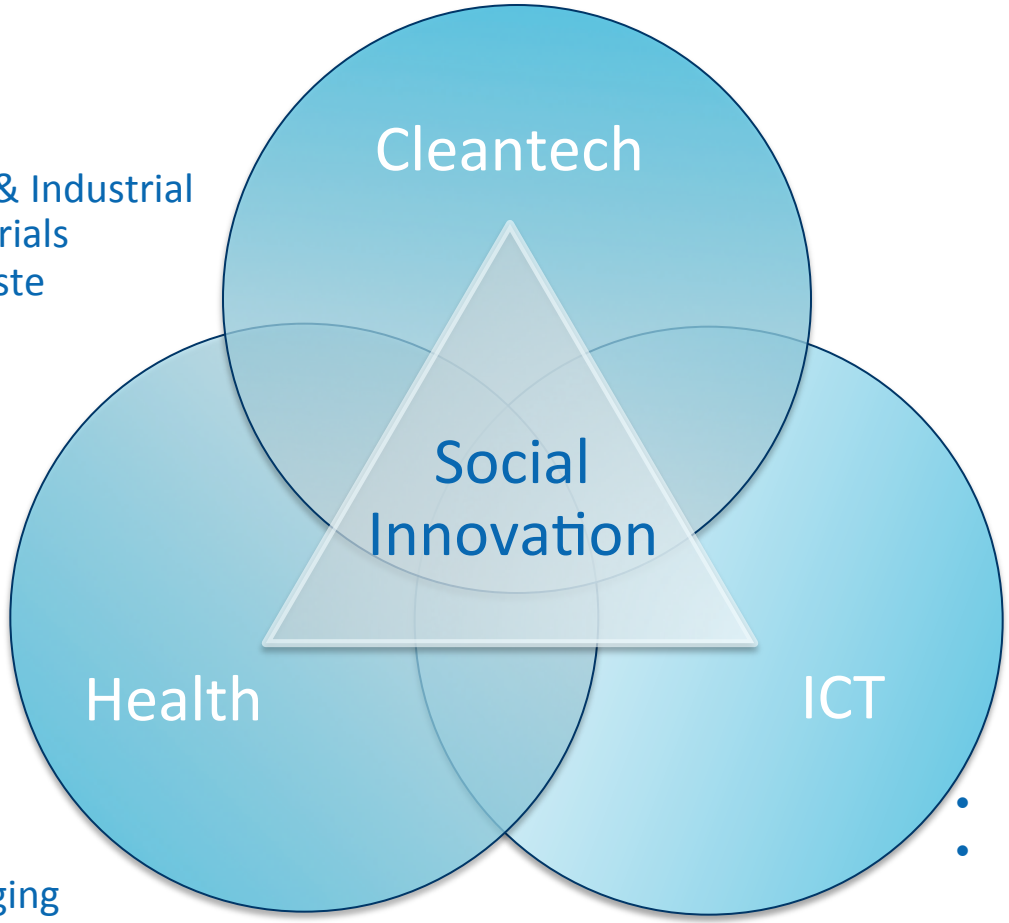
MaRS Focus on Key Sectors

Cleantech

- Energy
- Manufacturing & Industrial
- Advanced Materials
- Recycling & Waste
- Transportation
- Water



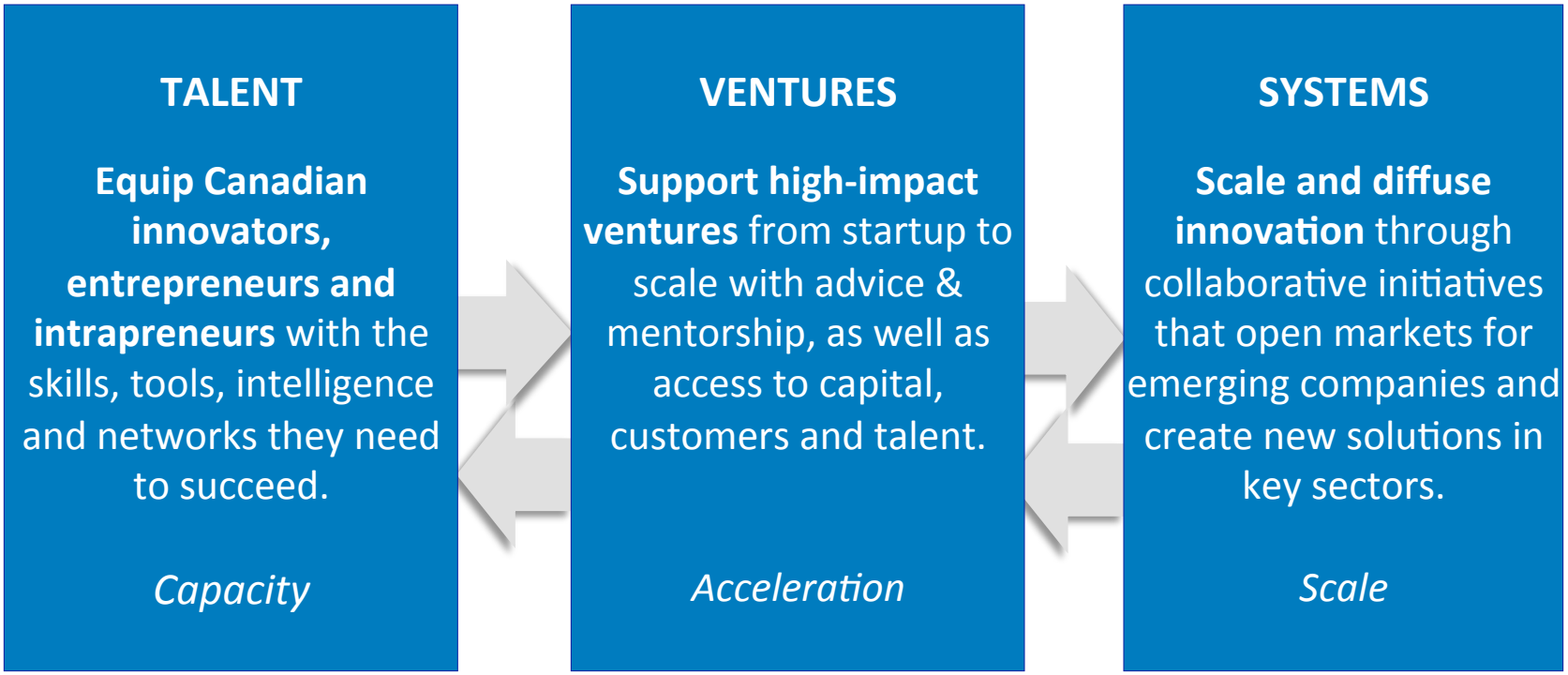
Health

- Healthcare IT
- Medical Devices
- Diagnostics & Imaging
- Therapeutics
- Consumer Health

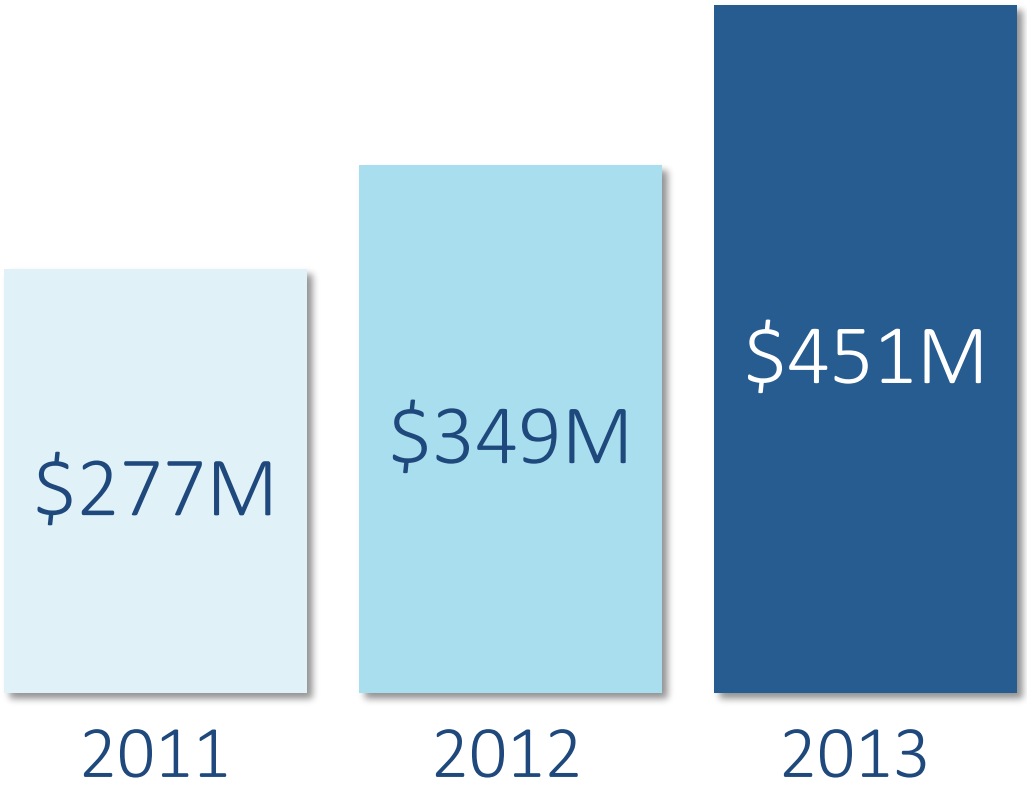
Information & Communications Technology (ICT)

- Financial technology
- Media and entertainment
- Retail and digital commerce
- Education technology
- Digital Health

Supporting Innovation



Capital raised by MaRS ventures



>$1 Billion

raised in the last 3 years

(78% from private sources)

SOURCE: ANNUAL VENTURE SURVEY RESULTS, 2011 ADMINISTERED BY DELOITTE; 2012 AND 2013 ADMINISTERED BY KPMG

MaRS Cleantech

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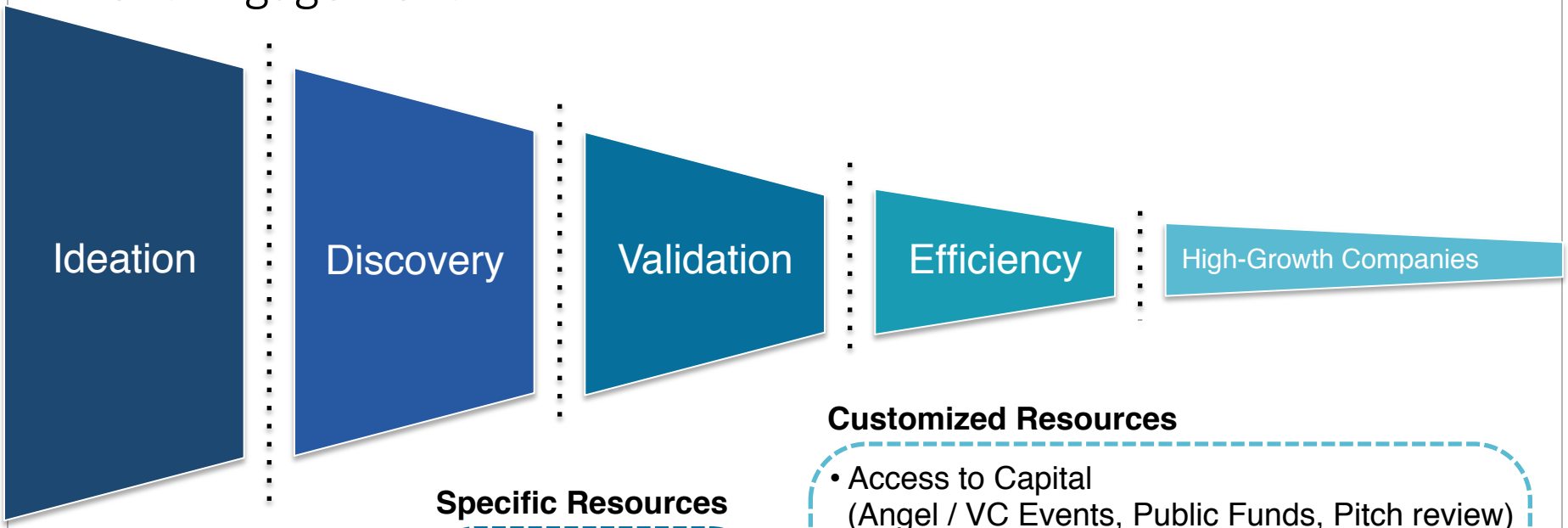
Venture Services

Client Engagement



Basic Resources

- Educational resources
- Ent101
- Best Practices
- Basic Market Intelligence
- Business Advice

Specific Resources

- Advisory team
- Facilitated education
- Business planning
- Advisory Panels
- Customized Market Intelligence

Customized Resources

- Access to Capital (Angel / VC Events, Public Funds, Pitch review)
- Access to Talent (Talent program, extended talent networks)
- Strategic introductions (Corporate and international partners)
- Primary Market Intelligence
- Media Exposure

ADVANCED ENERGY CENTRE

MaRS Cleantech | Ontario, Canada

Scale and diffuse innovation through collaborative initiatives that open markets and create new solutions.

Foster the adoption of innovative energy technologies in Ontario and Canada

Leverage those successes and experiences into international energy markets

Ontario

Capgemini
CONSULTING.TECHNOLOGY.OUTSOURCING

SIEMENS

MaRS

Green Button

Quantifying Smart Grid Benefits

Community Energy and Microgrids

Utility Transformation

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Energy Innovation Trends and Changes in the Energy Industry

Ontario's Support for Energy Innovation

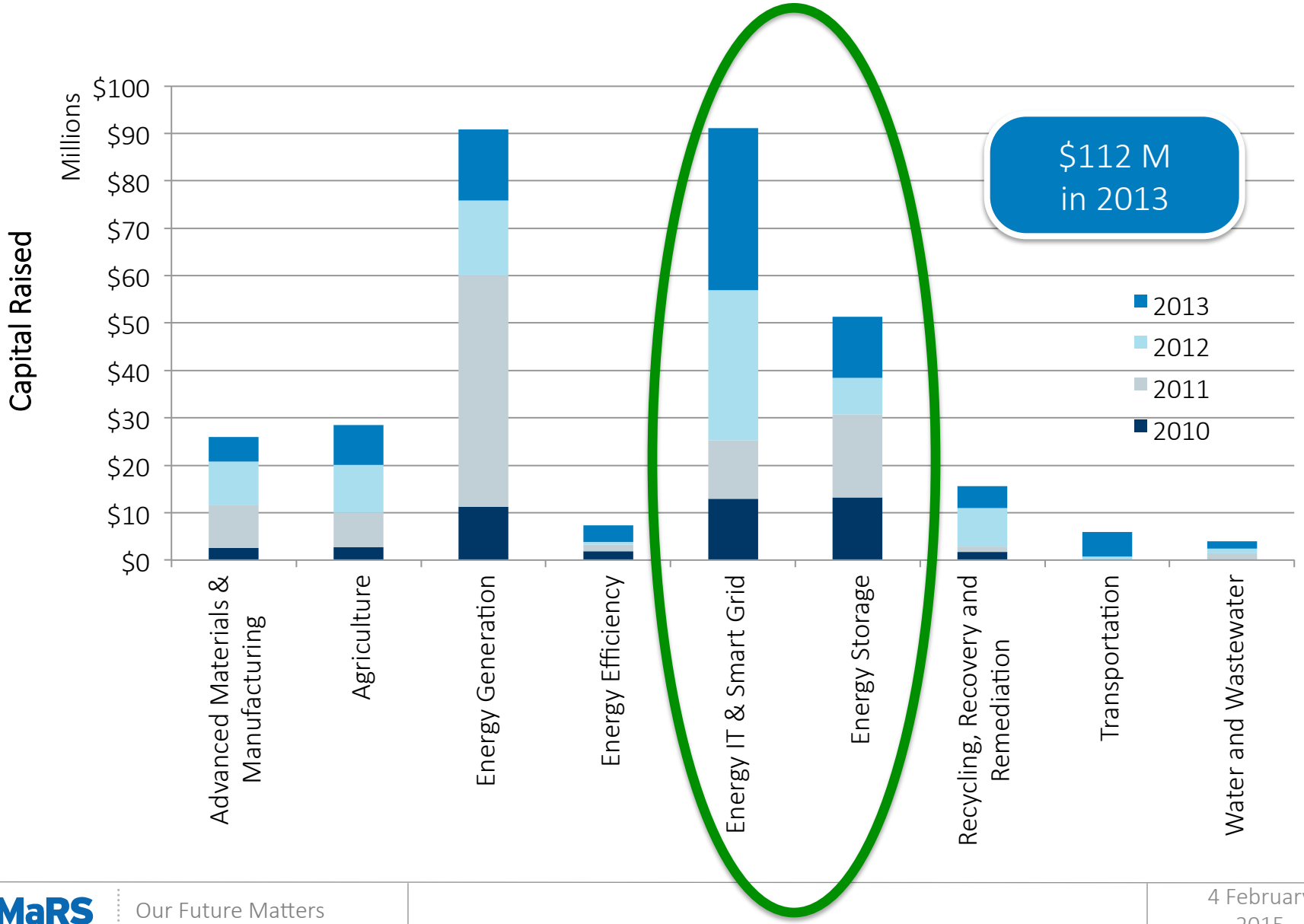
- Feed-in-Tariff Program…. manufacturing leads to innovation

- Smart Meters/MDMR
  - Combining data led to new discoveries
  - Access to Data… more effective consumer driven conservation

- Financial support
  - Innovation Demonstration Fund, SDTC, Smart Grid Fund
  - Investment Accelerator Fund

- 50 MW Energy Storage Procurement… seeing regulatory issues

Cleantech Company Capital Raises



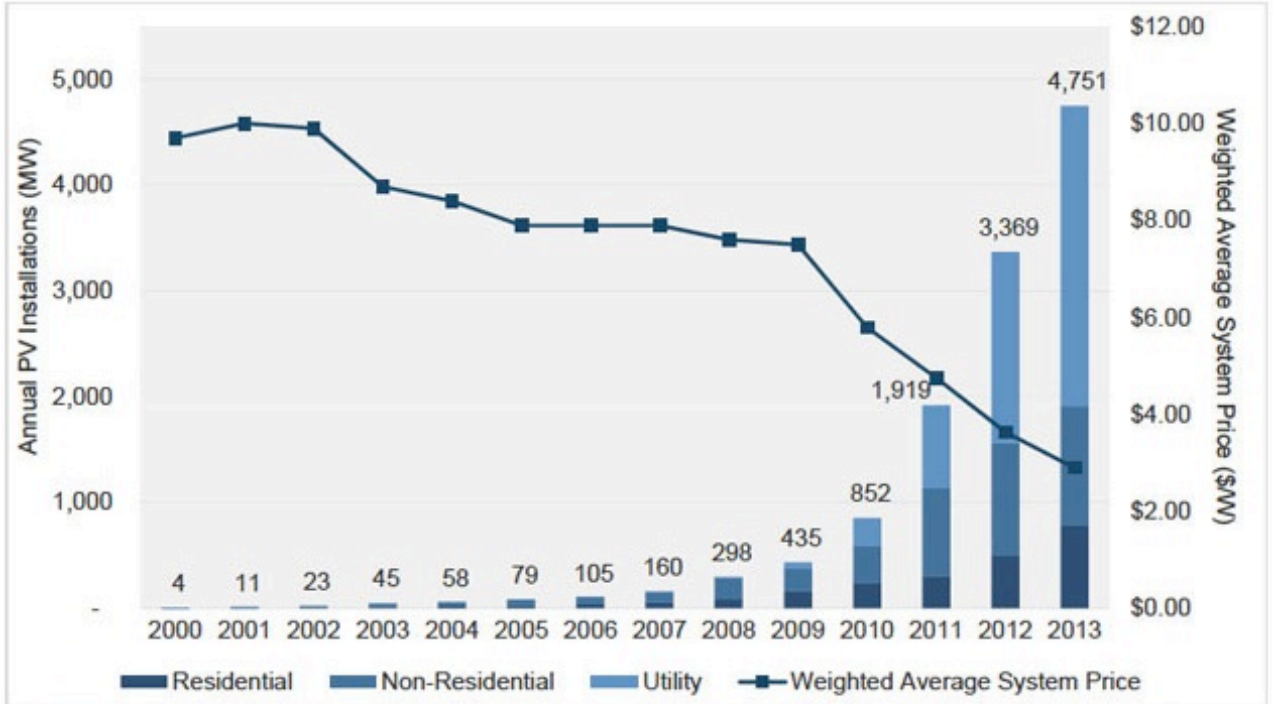
Energy IT and Energy Storage

5 factors changing the future of utilities

- Low cost distributed generation
- Customer control - behind the meter
- Energy storage innovation
- New business models
- Aging infrastructure and decreasing revenues for utilities

Low cost distributed generation

PV Cost Curve and Number of Installations



Installations (MW)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Residential	1	5	11	15	24	27	38	58	82	164	246	304	494	792
Non-Residential	2	3	9	27	32	51	67	93	200	213	339	831	1,072	1,112
Utility	0	3	2	3	2	1	0	9	16	58	267	784	1,803	2,847
Total Installations	4	11	23	45	58	79	105	160	298	435	852	1,919	3,369	4,751

GTM RESEARCH

40 YEARS SEIA Solar Energy Industries Association

Source: Greentech Media.

Customer control behind the meter

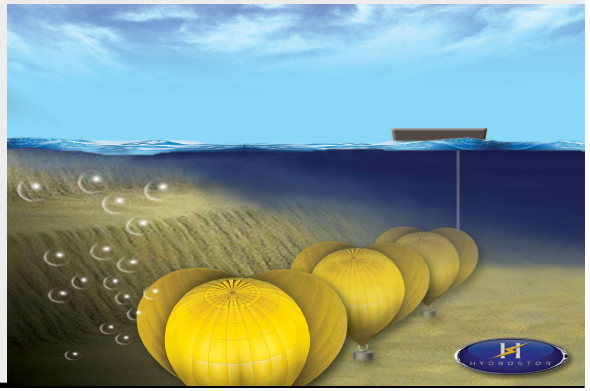
- The energy segment of the Internet of Things market will grow from a 2.25 billion market in 2012 to 8.61 billion by 2020

- Consumers save energy and control energy with smart appliances

- Appliance manufacturers could bid into the capacity based electricity markets

Energy storage innovation

Power to Gas energy storage	Community energy storage	Underwater Compressed Air
Linking of the electrical grid and natural gas networks	Multiple smaller systems deployed closer to point of use	Low cost existing equipment from other industries



New Business Models

- Convergence – IT with Energy and Health
- Capital light
- Fast paced
- Lower entry barriers
- Open collaboration

Aging infrastructure and decreasing revenues

Over the last 5 years the top 20 European utilities have lost 50% of their value

March 8, 2014 – Germany energy giant RWE takes €2.8 billion loss admitting it should have focused more on renewables and distributed energy rather than fossil fuels.

Source: Bloomberg New Energy Finance.

The impact – infrastructure disruption

- Customer relationships shift away from the utilities
- Distributed generation and efficiency further drive down utility revenue
- Utilities struggle to keep pace with innovation – spending limitations and risk adverse cultural

The challenge is to enable utilities, regulators, and innovators to work together and take advantage of the developments to better our infrastructure.

Understanding the barriers to technology adoption

Innovators

- Lack of insight into needs
- Don't understand utilities
- Financing alternatives require greater certainty
- Whole solutions

Utilities

- Don't know what is possible
- Culture of government-led direction
- Lack of competition
- Improperly allocated risk
- Culture of risk aversion
- Change not required
- Evolution v. Revolution
- Entrenched Supply Chain
- First to be Third

Regulations & Market Structure

- Changing Regulatory Environment
- Heavy Regulation
- Preference for Capital Solutions
- Diffused Benefits
- Complex System
- Misalignment of Economic Interests
- Ownership Structure of LDC's
- Organizational Structure of Electricity System

Industry ranking of barriers

Example: Energy storage barriers

- Market rules penalize energy storage applications
  - Global Adjustment, Debt Retirement, Uplifts and T&D Costs would be charged twice—once when energy is captured and again by the end-user consumer
- Regulations are not structured for energy storage
  - Example: service contracts for frequency regulation are designed for generation assets
- Benefits are difficult to monetize to multiple stakeholders
  - Reduced congestion and deferral of capital – T & D benefit
  - Integration of renewable generation on the distribution network – system operator benefit

The role of the existing industry in next steps

- Innovation is coming… the nature and type of it will depend on utility involvement… utility driven or customer driven
- Success of Ontario technology will depend on our speed… it can be done faster with utility partners
- Incent utilities to work with innovators
    - Projects at home
    - Selling abroad
- Regulatory mechanisms that reward operational and system efficiencies
- Market forces and challenges are similar in other jurisdictions

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THANK YOU!

Jonathan Dogterom

VENTURE LEAD,
CLEANTECH AND PHYSICAL SCIENCE